## WHAT IS CLAIMED IS:

1.   Polythiophenes of the formula
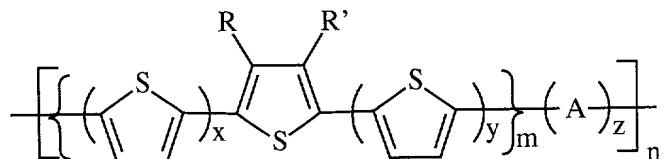

wherein R and R' are side chains; A is a divalent linkage; x and y represent the number of unsubstituted thienylene untis; z is 0 or 1, and wherein the sum of x and y is greater than zero; m represents the number of segments; and n represents the degree of polymerization.

2.   A polythiophene in accordance with claim 1 wherein said side chains R, and R' are independently selected from the group consisting of alkyl, alkyl derivatives of alkoxyalkyl; siloxy-substituted alkyl, perhaloalkyl and polyether; said A is an alkylene or arylene optionally of phenylene, biphenylene, phenanthrenylene, dihydrophenanthrenylene, fluorenylene, oligoarylene, methylene, polymethylene, dialkylmethylene, dioxyalkylene, dioxyarylene, or oligoethylene oxide; and n is from about 5 to about 5,000.

3.   A polythiophene in accordance with **claim 1** wherein the number average molecular weight (M_n) of the polythiophenes is from about 2,000 to about 100,000 and the weight average molecular weight (M_w) is from about 4,000 to about 500,000, both as measured by gel permeation chromatography using polystyrene standards.

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4.   A polythiophene in accordance with **claim 1** wherein said polythiophene is (1), (2), (3), (4), (5), or (6)
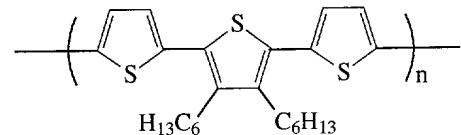
(1)
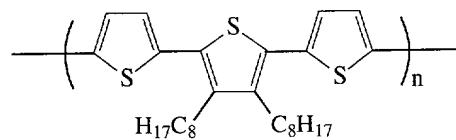
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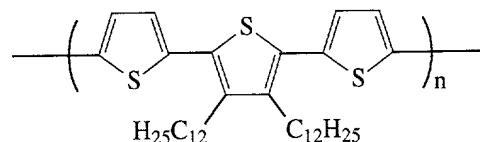
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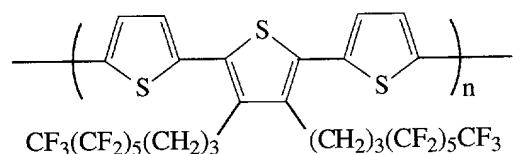
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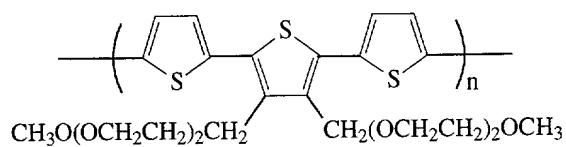
(5)
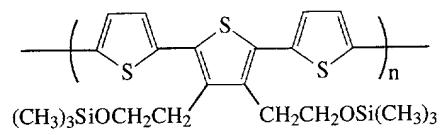
(6)

5. A polythiophene in accordance with **claim 1** wherein said polythiophene is (1), (2), or (3)
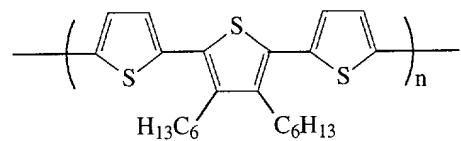

(1)
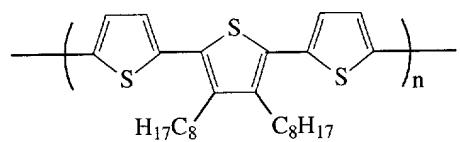
(2)
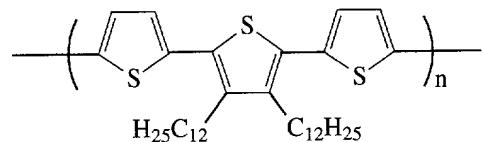
(3)

6. A polythiophene in accordance with **claim 1** represented

by

(1)

(2)

**(3)**

(4)

(5)

(CH₃)₃SiOCH₂CH₂ ... CH₂CH₂OSi(CH₃)₃ structure

(6)

H₁₅C₇ ... C₇H₁₅ structure

(7)

H₂₁C₁₀ ... C₁₀H₂₁ structure

(8)

C₁₀H₂₁ ... C₁₀H₂₁ structure

(9)

CF₃(CF₂)₅(CH₂)₃ ... (CH₂)₃(CF₂)₅CF₃ structure

(10)

C₈H₁₇ ... C₈H₁₇ / C₈H₁₇ ... C₈H₁₇ structure

(11)

$$CH_3O(OCH_2CH_2)_2CH_2 \qquad CH_2(OCH_2CH_2)_2OCH_3$$

(12)

$$H_{25}C_{12} \qquad C_{12}H_{25}$$

(13)
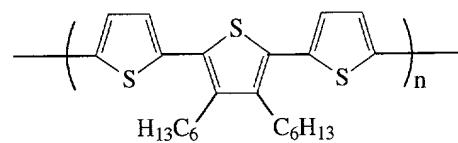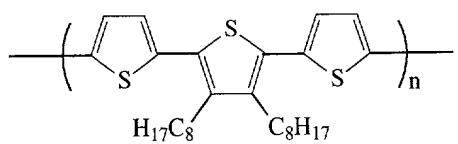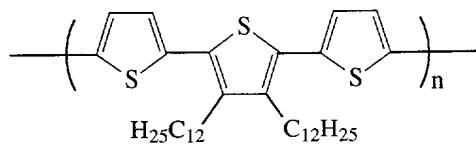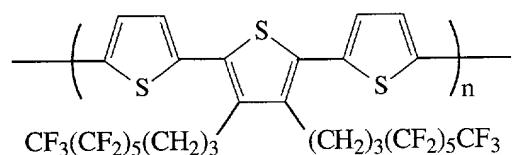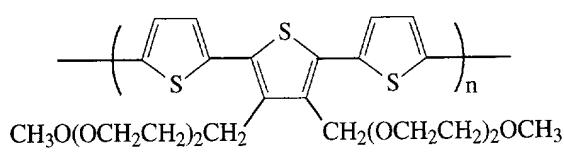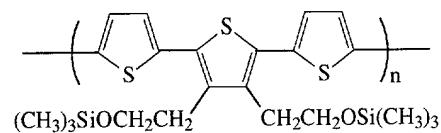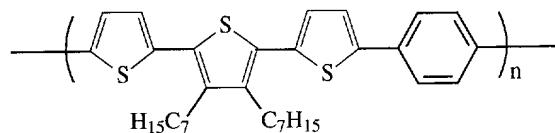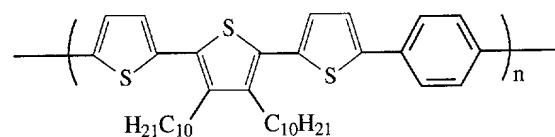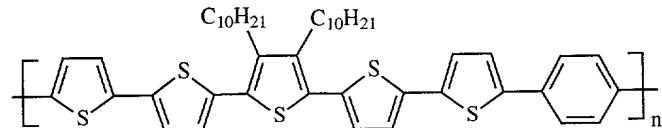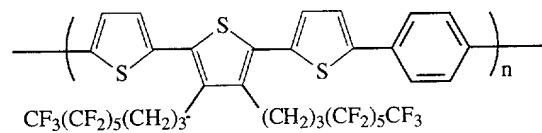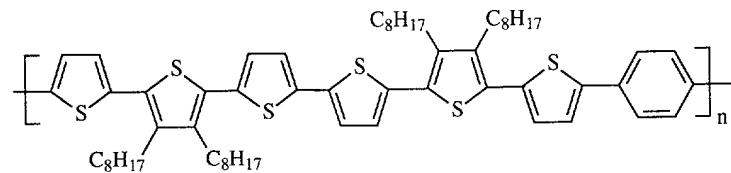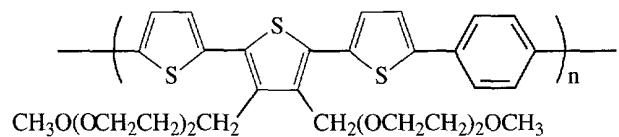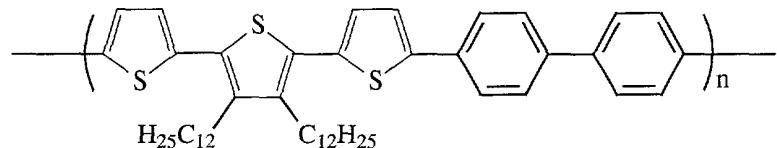
$$H_{13}C_6 \qquad C_6H_{13}$$
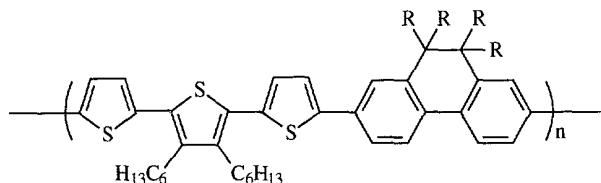
(14)

7.   A polythiophene in accordance with **claim 1** wherein x is a number of from zero to about 10, z is zero or 1, and m is from 1 to about 5.

8.   A polythiophene in accordance with **claim 1** wherein x is a number of from about 1 to about 7, z is zero or 1, m is from 1 to about 5, and n is from about 5 to about 3,000.

9.   A polythiophene in accordance with **claim 2** wherein said polyhaloalkyl is a perfluoroalkyl.

10.   A polythiophene in accordance with **claim 1** wherein M_w for said polythiophene is from about 5,000 to about 100,000, M_n is from about 4,000 to about 50,000; said side chain is alkyl with from about 1 to about 25 carbon atoms, or alkoxy with from 1 to about 25 carbon atoms, and A is an arylene.

11.   A polythiophene in accordance with **claim 1** wherein said R and R' contain from about 3 to about 20 carbon atoms.

12.   A polythiophene in accordance with **claim 1** wherein R and R' are independently selected from the group consisting of alkyl, alkyl derivatives of alkoxyalkyl; siloxy-substituted alkyl, perhaloalkyl of perfluoroalkyl and polyether; A is selected from the group consisting of arylene of phenylene, biphenylene, phenanthrenylene, dihydrophenanthrenylene, fluorenylene, dioxyalkylene, and dioxyarylene.

13.   A polythiophene in accordance with **claim 1** wherein said R and R' are independently selected from the group consisting of propyl, butyl, pentyl, hexyl, heptyl, octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, pentadecyl, and isomers thereof.

14.   A polythiophene in accordance with **claim 1** wherein R and R' are selected from the group consisting of hexyl, heptyl, octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, and pentadecyl; A is selected from the group consisting of phenylene, biphenylene, and fluorenylene; x and y are each independently a number of from zero to about 10; and m is a number of from 1 to about 5.

15.   A polythiophene in accordance with **claim 1** wherein n is from about 5 to about 5,000; the number average molecular weight (M_n) of the polythiophene is from about 2,000 to about 100,000; weight average molecular weight (M_w) is from about 4,000 to about 500,000, both as measured by gel permeation chromatography using polystyrene standards.

16.   A polythiophene in accordance with **claim 1** wherein A is phenylene, biphenylene, or fluorenylene.

17.   A polythiophene in accordance with **claim 1** wherein n is from about 5 to about 5,000.

18.   A polythiophene in accordance with **claim 1** wherein n is from about 10 to about 1,000.

19. A polythiophene in accordance with **claim 1** wherein said polythiophene is selected from the group consisting of polythiophenes of Formulas (1) through (8)


(1)

(2)

(3)

(4)

(5)

$(CH_3)_3SiOCH_2CH_2$ $CH_2CH_2OSi(CH_3)_3$

(6)

$H_{15}C_7$ C_7H_{15}

(7)

$H_{21}C_{10}$ $C_{10}H_{21}$

**(8)**
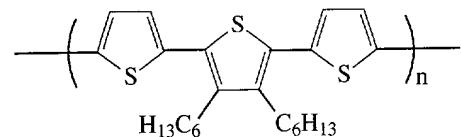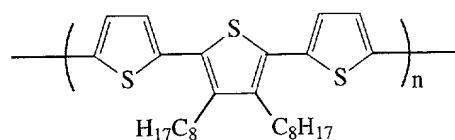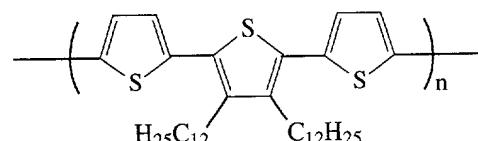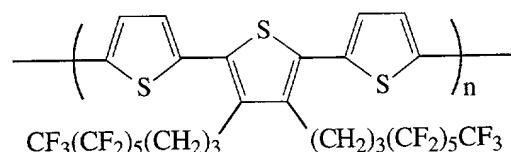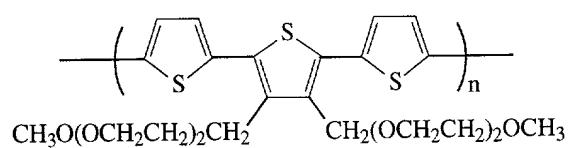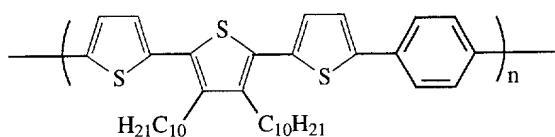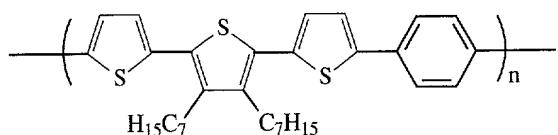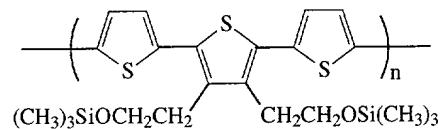
20. A polythiophene in accordance with **claim 1** wherein x, y and m are from 1 to 3, and z is 0 or 1.

21. A polythiophene in accordance with **claim 1** wherein x, y and m are 1, and z is 0 or 1.

22. A polythiophene in accordance with **claim 1** wherein x, y are from 0 to 3, m is from 1 to 3, and z is 0 or 1.

23. A polythiophene in accordance with **claim 1** wherein x, y and m are 1, and z is 0.

24. A polythiophene in accordance with **claim 1** wherein M_n is from about 4,000 to about 50,000, and M_w is from about 5,000 to about 100,000.

25. A polythiophene in accordance with **claim 1** wherein the sum of x and y is from about 1 to about 10.

26. A polythiophene in accordance with claim 1 wherein the sum of x and y is from about 1 to about 5.

27. A polythiophene in accordance with claim 1 wherein n is from about 10 to about 1,000, and m is from about 1 to about 5.